

Laboratory experiments for chemical kinetics at very low temperature : Why is the efficiency of gas-phase reactions overestimated ?

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Low-temperature kinetic rate coefficients under adiabatic expansion revisited by an alternative interpretation.

Over the past 30 years, scientists reported an exceptional increase in chemical reactivity for gas-phase systems below around 100 K, deviating from Arrhenius' law. This surprising increase in the efficiency of chemical reactions has been measured almost systematically in the laboratory for a wide range of systems. The reason put forward for this phenomenon is a "quantum mechanical tunneling effect", which predominates at these very low temperatures.[1]

Yet another interpretation exists: the signals measured do not correspond to an increase in chemical reactivity, but to a diffusion effect, i.e., a physical artifact in the context of these measurements.[2]

~200 publications concerned by this reinterpretation.

The prediction that follows from this interpretation is that these experimentally measured reaction kinetics have been greatly overestimated. The products, if formed, will not be measurable in the expected stoichiometric proportions.

For instance, water is said to catalyze gas-phase reactions at these very low temperatures, and the results of these observations are claimed to be supported by quantum chemical calculations.

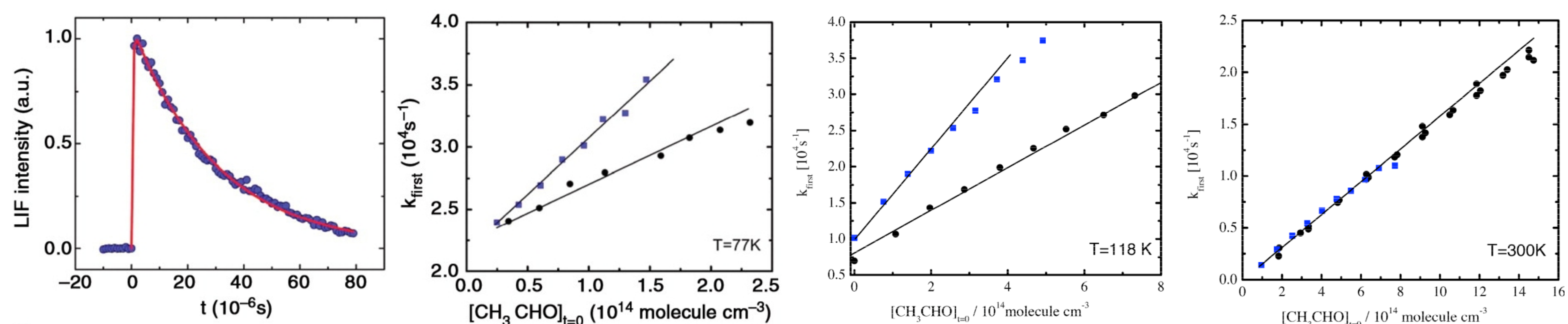


FIGURE 1 – Problem illustration. Data from a 2007 Science study [3]. At room temperature, measurements with water (blue dots) and without water (black dots) match. But apparent H₂O catalysis in supersonic expansion (77K/118K).

Non-zero intercept ↔ "diffusion" ↔ non homogeneous (or uniform) middle ↔ flow density drop ↔ physical artifact.

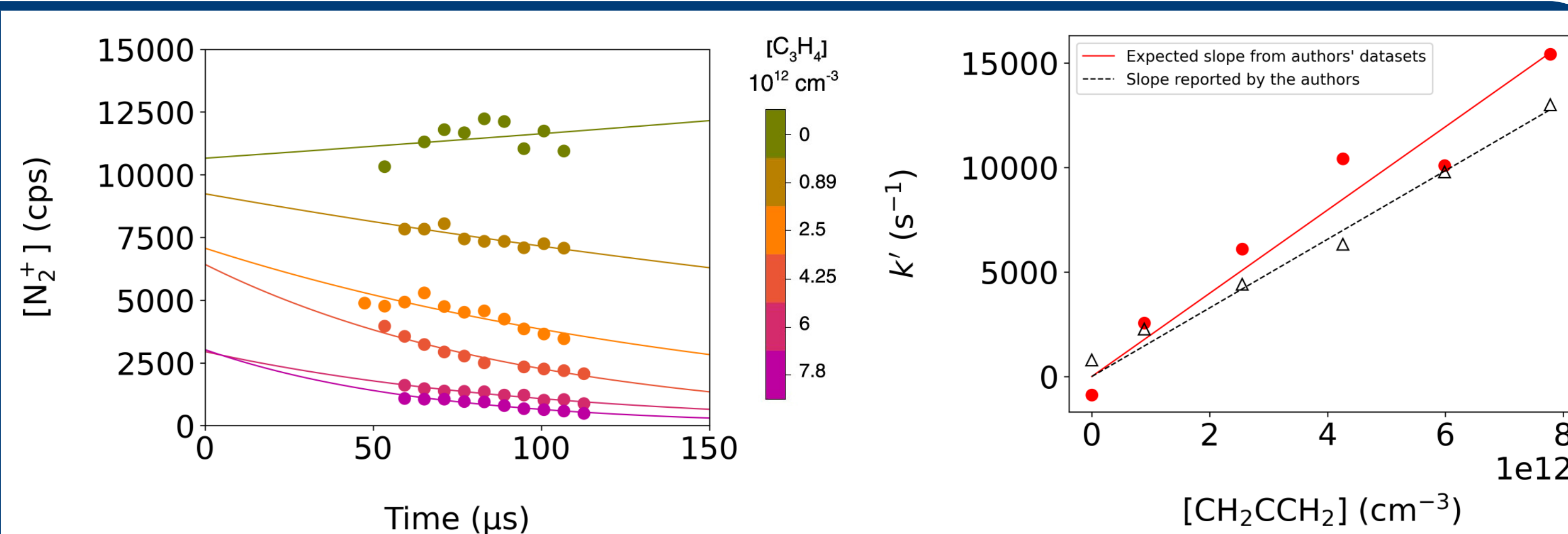


FIGURE 2 – Falsifications that change everything [2].

After an alert and about 2 years later, the CNRS scientific integrity mission concludes:

"At most, two points of questioning were raised. One of these has given rise to a published correction, which clarifies an ambiguity in the presentation of results on a figure. The other invites a possible correction, should the understanding of the phenomenon have evolved since the publication of the article."

But the expert reports are secret and no data has been examined. Despite the absence of contradictory debate, the CNRS CEO validated this pseudo-investigation. Case closed ?

Reprisals: the price to pay for disruptive evidence? Let's discuss!

Numerous attempts at intimidation, conference bans, professional blockades, etc., by well-established french CNRS researchers and even officials in positions of responsibility.

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